

REMARKS

The applicant acknowledges the Examiner's withdrawal of claim 13 as being drawn to a non-elected invention.

As shown above under AMENDMENT A, the applicant has amended the paragraph beginning on page 9, line 12 to correct an inadvertent typographical error that incorrectly specified the reference number for the actuators as 18 rather than 30". The applicant has also amended Fig. 10 accordingly. No new matter has been added.

The Examiner rejects claims 1, 2, 11, and 12 under 35 USC §102(b) as being anticipated by Scott (U.S. Patent No. 4,066,343).

The improved, lightweight integrated actuator meniscus mirror of the applicant's invention requires no reaction mass yet has a good natural frequency, aerial density, excursion, and correctability characteristics. The claimed integrated actuator meniscus mirror as recited in claim 1 includes: 1) an optical substrate including a mirror surface on one side and a support structure on the other, and 2) a plurality of actuators embedded in the support structure spaced from and generally parallel to the mirror surface for applying bending moments to the mirror surface for controllably altering the shape of the mirror surface. The support structure of the optical substrate provides for strengthening and further supporting the mirror surface. *See* the applicant's specification, page 7, lines 2-6. The claimed actuators act directly on the support structure in which they are embedded to controllably alter the shape of the mirror surface. *See* the applicant's specification, page 7, lines 14-18.

In contrast, Scott does not teach, suggest or disclose an integrated actuator meniscus mirror that includes an optical substrate including a mirror surface on one side and a

Amendments to the Drawings:

The attached sheet 8/8 of drawings includes changes to Fig. 10. This sheet, which includes Fig. 10, replaces the original drawing sheet 8/8 containing Fig 10.

Attachment: Replacement Sheet 8/8.

support structure on the other that provides for strengthening and support of the mirror. Scott also does not teach, suggest or disclose a plurality of actuators embedded in the support structure spaced from and generally parallel to the mirror surface for applying bending moments to the mirror surface for controllably altering the shape of the mirror surface. Instead, Scott teaches and discloses using posts that extend perpendicularly from the mirror surface and then disposing the actuators between the posts:

In all embodiments of this invention however, posts are extended perpendicularly from the specimen for which configuration is being controlled. Otherwise, force producing actuators are disposed across the specimen between the posts, so that equal and opposite moments result within the specimen from each actuator.

(Col. 1, lines 52-58, emphasis added.)

More proof of the use of posts that extend from the mirror surface and actuators disposed between the posts is disclosed in Scott by:

Equal and opposite moments are developed within the specimen for each actuator utilized in the embodiments of this invention as illustrated in FIG. 1 where two posts 1 and 2 extend from disc 4 and a force producing actuator 6 is disposed thereacross between the posts 1 and 2.

(Col. 1, line 67 – Col. 2, line 4, emphasis added.) *See* also, Fig. 1 of Scott.

Clearly, the posts that extend from the disc as disclosed by Scott are not designed for strengthening and supporting the mirror surface. Instead, the posts are used only to dispose the actuators therebetween. Moreover, the actuators as taught and disclosed by Scott are not embedded in the support structure.

Accordingly, Scott does not teach, suggest, or disclose each and every element of the applicant's invention as recited in claim 1, namely an optical substrate having a mirror surface on one side and a support structure on the other side, and a plurality of actuators

embedded in the support structure spaced from and generally parallel to the mirror surface for applying bending moments to the mirror surface for controllably altering the shape of the mirror surface. Accordingly, claim 1 is patentable and allowable under 35 USC §102(b). Because claims 2, 11, and 12 depend from an allowable base claim, claims 2, 11, and 12 are patentable and allowable under 35 USC §102(b) over Scott.

The Examiner rejects claims 1, 2, 11, and 12 under 35 USC §102 (b) as being anticipated by Sawicki (U.S. Patent No. 5,365,379). Similar to Scott, Sawicki does not teach, suggest, or disclose an integrated actuator meniscus mirror that includes an optical substrate including a mirror surface on one side and a support structure on the other that provides for strengthening and support of the mirror. Sawicki also does not teach, suggest or disclose a plurality of actuators embedded in the support structure spaced from and generally parallel to the mirror surface for applying bending moments to the mirror surface for controllably altering the shape of the mirror surface. Instead, Sawicki teaches and discloses a laser correcting mirror that utilizes spaced legs that are rigidly fixed to, and extend from, the mirror body with the actuators (adjustment mechanisms) disposed between the spaced legs:

The legs 14, 16, 18, 20, 22, 24, 26 and 28 are rigidly affixed to the mirror body 12 such that forces applied to the legs 14, 16, 18, 20, 22, 24, 26 and 28 will be transferred to the mirror body 12 and will tend to distort the mirror body 12 along with the light reflective surface 13 thereof. A first adjustment mechanism 42 is associated with the first leg pair 34 for applying forces thereto. In like manner, a second adjustment mechanism 44 is associated with the second leg pair 36, a third adjustment mechanism 46 is associated with the third leg pair 38 and a fourth adjustment mechanism 48 is associated with the fourth leg pair 40.

(Col. 4, lines 17–28, emphasis added.)

Fig. 1 of Sawicki also clearly shows legs 14-28 extending from mirror body 12 and the actuators (adjustment mechanisms 42-48) disposed between the legs. The actuators of Sawicki apply forces to the various legs to achieve bending moments to the mirror surface for controllably altering the shape of the mirror surface. Clearly, the rigidly affixed legs that extend from the mirror body of Sawicki are not designed for strengthening and supporting the mirror surface. Instead, the legs are used to simply dispose the actuators therebetween. Moreover, the actuators as taught and disclosed by Sawicki are not embedded in the support structure.

Therefore, for the reasons stated above, Sawicki does not teach, suggest, or disclose each and every element of the applicant's invention, namely, an optical substrate having a mirror surface on one side and a support structure on the other side, and a plurality of actuators embedded in the support structure spaced from and generally parallel to the mirror surface for applying bending moments to the mirror surface for controllably altering the shape of the mirror surface as recited in the applicant's claim 1. Accordingly, claim 1 is patentable and allowable under 35 USC §102(b) over Sawicki. Because claims 2, 11, and 12 depend from an allowable base claim, claims 2, 11, and 12 are patentable and allowable under 35 USC §102(b).

The Examiner rejects claims 1, 2, 5-9, 11, and 12 under 35 USC §102(b) as being anticipated by Fuschetto (U.S. Patent No. 4,226,507).

Fuschetto does not teach, suggest, or disclose an integrated actuator meniscus mirror that includes an optical substrate including a mirror surface on one side and a support structure on the other that provides for strengthening and support of the mirror. Fuschetto also does not teach, suggest or disclose a plurality of actuators embedded in the support

structure spaced from and generally parallel to the mirror surface for applying a bending moment to the mirror surface for controllably altering the shape of the mirror surface.

Instead, Fuschetto teaches and discloses utilizing actuators that are connected between flexure blocks attached to mounting pads on the mirror and a floating block at the center of the mirror:

Shown is a mirror 11 having at its edges appropriate mounting pads 12 formed in the rear surface of the mirror. Three actuators in the form of piezo stacks, i.e., stacks of piezo electric ceramic discs, are provided and designated respectively 13, 15, and 17. The piezo stack 13 is arranged along what is called the $\phi 1$ axis, the piezo stack 15 along what is designated the $\phi 2$ axis and the piezo stack 17 along the y axis. Each piezo stack is split in two and thus piezo stack 13 is made up of sub-stacks 13a and 13b, stack 15, of sub-stacks 15a and 15b, and stack 17 of sub-stacks 17a and 17b. Each of the sub-stacks is connected between a floating block 19 at the center of the mirror and a flexure block 23 which is secured to one of the mounting pads 12. Connection of the piezo stacks to the floating block 19 is by means of a flexure 21.

(Col. 2 lines 31-46, emphasis added.)

The flexure blocks, mounting pads and a floating block at the center of the mirror as disclosed by Fuschetto are not designed for strengthening and supporting the mirror surface. Instead, the blocks, mounting pads and a floating block are used to dispose the actuators therebetween. The actuators as taught and disclosed by Fuschetto are clearly not embedded in the support structure.

Accordingly, Fuschetto does not teach, suggest, or disclose each and every element of the applicant's invention as recited in claim 1, namely, an optical substrate having a mirror surface on one side and a support structure on the other side, and a plurality of actuators embedded in the support structure spaced from and generally parallel to the mirror surface for applying bending moments to the mirror surface for controllably altering the

shape of mirror surface. Accordingly, claim 1 is allowable and patentable under 35 USC §102(b). Because claims 2, 5-9, 11, and 12 depend from an allowable base claim, claims 2, 5-9, 11 and 12 are allowable and patentable under 35 USC §102(b).

The Examiner rejects claims 3 and 4 under 35 USC §103(a) as being unpatentable over Scott, Sawicki, or Fuschetto in view of Anthony *et al.* (U.S. Patent No. 4,657,358). The Examiner also rejects claims 9 and 10 under 35 USC §103(a) as being unpatentable over Scott or Sawicki in view of Aldrich *et al.* (U.S. Patent No. 4,674,848), Anthony *et al.*, or Shen (U.S. Patent No. 6,236,490). The Examiner also rejects claim 10 under 35 USC §103(a) as being unpatentable over Fuschetto, in view of Aldrich *et al.*, Anthony *et al.*, or Shen. As discussed above, neither Scott, Sawicki, or Fuschetto, alone or in combination, teach, disclose or suggest each and every element of the applicant's invention as recited in independent claim 1. Accordingly, the Examiner's rejection of dependent claims 3, 4, 9, and 10 under 35 USC §103 is traversed.

If for any reason this Response is found to be incomplete, or if at any time it appears that a telephone conference with counsel would help advance prosecution, please telephone the undersigned or his associates, collect in Waltham, Massachusetts, at (781) 890-5678.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Roy J. Coleman', written over a horizontal line.

Roy J. Coleman
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